# Department of Toxic Substances Control

# Santa Susana Field Laboratory Radiological Look Up Table Meeting

DSTC Chatsworth Office

December 5, 2012

# Ground Rules

*Please:*

- Silence all phones, PDAs, and electronics
- Limit conversations during the presentation
- Treat everyone with the same level of respect you expect from others
- Hold your questions to the end of the presentation
- Video/audio recording

# Agenda

6:10 pm: EPA – Summary of US EPA Final Technical Memorandum – Look-up Table Recommendations (November 27, 2012) Posted on DTSC's website under What's New

http://www.dtsc-ssfl.com/files/lib_doe_area_iv/epaareaivsurvey/techdocs/65778_Final_Tech_Memo_Lookup_Table_Recommendations_112712.pdf

- Questions/discussion (30 min)

7:00 pm: DTSC – Use of US EPA rad-LUT Tech Memo in developing the LUT values

- Questions/discussion (30 min)

7:50 pm: Upcoming Events

8:00 pm: Adjourn

# United States Environmental Protection Agency (USEPA)

## Santa Susana Field Laboratory (SSFL)

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# Final Radiological Look-up Table

## December 5, 2012

# Agenda

- Purpose of the Look Up Table Technical Memorandum
- Concepts
  - BTVs, MDCs, Cleanup Levels
  - Action Levels and Decision Levels
  - Measurement Quality Objectives
  - Method Uncertainty
- Development and Use of LUT Values
- Laboratory Contracting Recommendations
- Recommendations/Suggestions

# Look Up Table (LUT)

USEPA recommends that DTSC develop a "Look-Up Table" of values for comparison to reported laboratory results, to determine whether a sample contains contamination requiring remediation.

# Look Up Table (LUT)

- The LUT Technical Memorandum describes the process for developing LUT values.
- Determination of final LUT values depends, in part on the Measurement Quality Objectives (MQOs) to be negotiated between DTSC and the contract radioanalytical laboratory.

# LUT Values

- LUT values are based on the Background Threshold Values (BTVs) determined during the Background Study.
- BTVs are not, by themselves, the LUT values.

# BTVs

- BTVs are the upper limit of radioactivity expected in an uncontaminated background sample.

# Cleanup Levels

- If the laboratory's Minimum Detectable Concentration (MDC) is higher than the BTV, the MDC becomes the Cleanup Level (Action Level).

# Action Level (AL)

- The TRUE SAMPLE CONCENTRATION (which is impossible to know exactly) at which some action should be taken; i.e., greater of BTV or MDC.

Action Level = Cleanup Level

# Decision Level (DL)

- The LABORATORY RESULT at which the decision is made that it is probable, at the specified confidence interval, that the Action Level has been exceeded.

Decision Level = LUT Value

# AL vs. DL

- The difference between AL and DL is related to the Method Uncertainty ($U_M$), and
- the tolerance for making certain types of decision errors.

# Method Uncertainty ($U_M$)

- $U_M$ reflects expected variability in results produced by an analytical method.
  - EPA recommends that $U_M$ should be limited to 10% at the cleanup level, wherever possible…
  - …to keep decision errors at the cleanup level to 5% or less.

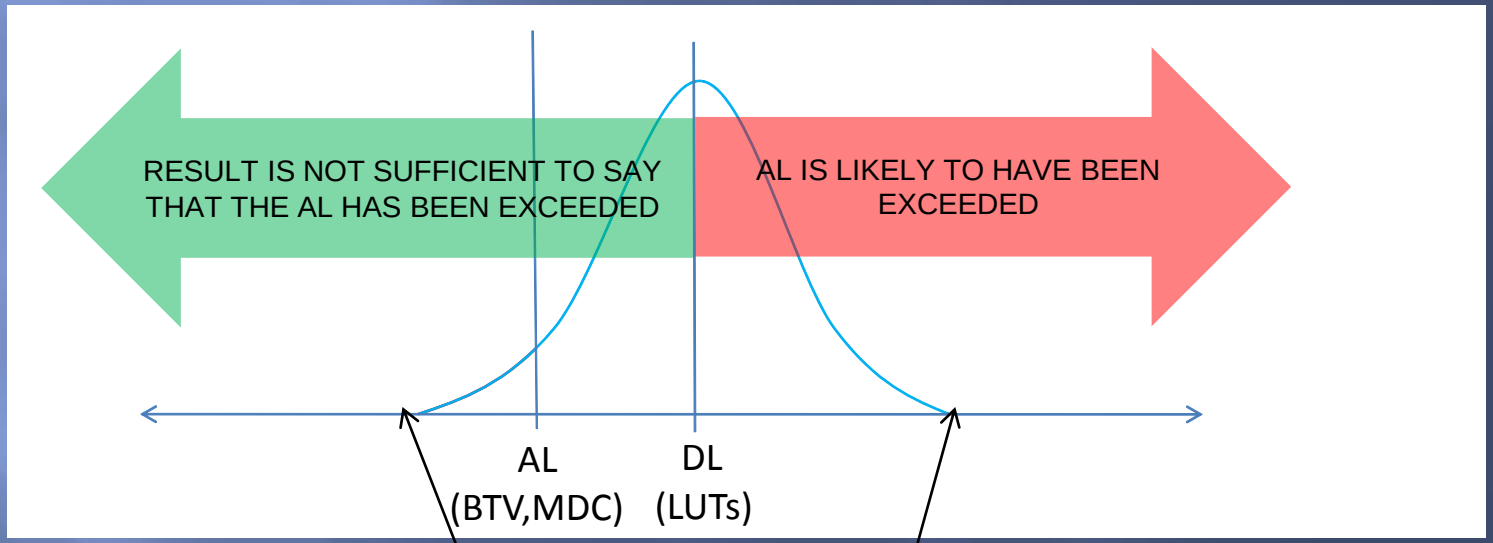
$$LUT = Cleanup\ Value + 1.645 * U_M$$

Where:

Cleanup Value = Max (BTV,MDC)

# Action Level (AL) versus Decision Level (DL)

1.645 * method uncertainty




Range of possible true values represented by a laboratory result equal to the DL

# DTSC's Look-Up Table (LUT) values

*"If the laboratory result is equal to or greater than the LUT value, it is very likely (although still not 100% certain) that the sample is contaminated at a level equal to or greater than the cleanup level."*

# USEPA's Recommendations…

# Contracting Laboratory Services

- Use a performance-based approach, i.e. specify requested Measurement Quality Objectives (MQOs).
- Focus on Priority One radionuclides (identified in Table 1, Section I of LUT Tech. Memo).
- Give preference to the laboratory that can provide the lowest $U_M$ and MDCs for Cs-137 and Sr-90.

# Contracting Laboratory Services

- To ensure consistency in the decision making process, the MQOs for all results for a given analyte should be the same.
  - Use only one laboratory for all radiological analyses, or
  - If multiple laboratories are used, make sure the MQOs are the same, which would be very difficult.

# Additional Recommendations

- DTSC will need to determine final locations/areas of contamination once LUT values (future decision levels) are calculated

- Use the BTVs as starting point for all future phases of investigation, remediation, and closure of the Area IV and Northern Buffer Zone Study Areas

# Recommendations (cont.)

- Use the EPA's LUT Technical Memorandum to assist in the development of LUT values (decision levels).

- When comparing sample results to the LUT values, do not add the sample-specific uncertainty to the result.

# Questions?

# Use of EPA's Radiological Lookup Table Technical Memorandum in Developing the Lookup Table Values

Laura Rainey
Department of Toxics Substances Control
December 5, 2012

# Agenda

- EPAs Investigation
- Decision Levels
- Addressing Uncertainties
- EPA Recommendations
- Radiological Look-Up Table Development

# EPA's Investigation Scope

- Summary of EPA's Draft Final Soils Report:
  - Conservatively identifies radiological areas of interest;
  - Does NOT identify remedial locations or areas of contamination.

- Remedial locations and areas of radiological contamination will be determined through use of the Look-Up Table, which DTSC will develop after consideration of EPA's recommendations.

# Radiological Areas of Interest

- Radiological areas of interest were conservatively identified through use of Field Action Levels.
- Decision Levels are needed for making decisions regarding the exceedence of established cleanup levels, and should take into account the overall uncertainty of the analytical method as well as the data user's tolerance for making decision errors.
- Because FALs are not Decision Levels, the radiological areas of interest are not *necessarily* "contaminated" locations or areas.

# Field Action Levels

- Field Action Levels (FAL): EPA used for screening soil and sediment characterization data.
- FALs are the highest of the BTV or method MDC for a given radioisotope. FALs are conservative, and are the lowest values used for screening purposes.
- Use of conservative FALs for screening soil/sediment data is appropriate for characterization.
- Use of FALs alone for making cleanup decisions is not appropriate, as they are not Decision Levels and do not take into account method uncertainty.

# Decision Levels

- Decision Levels are used for making important decisions.
  - Use Radionuclide Reference Concentrations (RRCs) to identify Priority One Radionuclides
  - Use Look-Up Table (LUT) values to decide on remediation of contaminated soil.

- Decision levels take into account method uncertainty and, by definition, are larger values than action levels.

# Use of LUT Value

- Per EPA's recommendation, the correct use of LUT values is that lab results above the LUT values are likely, at the 95 percent confidence interval, to represent an exceedance of the cleanup level.

# LUT Value as a Decision Level

- EPA recommends:

$$\text{LUT Value} = \text{Cleanup Level} + 1.645 * U_M$$

Where:

Cleanup Level = Greater of the BTV or lab method MDC

$U_M$ = the lab's method uncertainty for results at the Cleanup Level

1.645 = coverage factor for addressing decision error rate

# LUT Value Equation

LUT Value = Cleanup Level + $1.645 * U_M$

- LUT Value equation addresses the need to control dispersion of data resulting from method uncertainties at low levels, in this case, at the Cleanup Level value. Accomplished through the $U_M$ term.

- The equation defines an acceptably low decision error rate of ~5%. Accomplished through the coverage factor term (e.g., 1.645).

# Sources of Uncertainty

- EPA recommends following procedures described in MARLAP (Multi-Agency Radiological Analytical Protocol; EPA, 2004)

- Sources of uncertainty include, but are not limited to:
  - radiation counting time
  - sample size
  - method modifications
  - instrument calibration
  - tracers, carriers, or other methods of yield measurement
  - variable instrument backgrounds
  - variable counting efficiency

# Adjusting for Uncertainty

- Adjusting for method uncertainty at the cleanup level (whether BTV or MDC) will allow one to say with a specified level of confidence that the actual soil activity concentration has exceeded the cleanup level, therefore requiring remediation.

# Uncertainty and Cesium 137

- Cs137 had the highest frequency of FAL exceedances (291 soil samples). Many of these exceedances are just slightly above the FAL, but are less than the RRC, which is adjusted for method uncertainty.
- The Cleanup Level for Cesium 137 is its BTV (0.193 pCi/g), which is also the FAL.
- The Radiological Reference Concentration (RRC), for Cs137 is 0.225 pCi/g. RRC's are lab-specific. In this case, both labs were able to similarly constrain method uncertainty, resulting in a single RRC value.

$$\mathbf{RRC = AL + 1.645 * U_M}$$

# Uncertainty and Strontium 90

- Sr 90 has the second highest frequency of exceedances of FALs (153 samples).
- The BTV for Sr 90 is 0.0750 pCi/g. One lab's Method MDC (0.387 pCi/g) was greater than the BTV, yet the other lab's Method MDC (0.0677 pCi/g ) was less than the BTV.
- For one lab, the FAL is the BTV. For the other lab, the FAL is the Method MDC. Multiple labs can generate multiple MDCs. Which FAL do you use? This is an inherent issue with use of multiple labs.

# EPA Recommendations

- Focus on 17 Priority One radionuclides.
  - Based on exceedance of RRCs – represent a priority group of analytes on which future phases might concentrate and focus resources.
- Give preference to the lab that can provide the lowest $U_M$ and MDCs (e.g., MQOs) for Cs-137 and Sr-90.
  - 12 Priority One rads have BTVs higher than the method MDCs. It is likely that labs can constrain method uncertainty at BTV values for most of these. Cs-137 is among these.
  - Remaining 5 radionuclides have MDCs > BTVs. Sr-90 is among these.

# Measurement Quality Objectives

- The project MQO process includes specifying constraints on the required Method Uncertainty *($U_{MR}$)* at a specified action level, starting with the BTV as the preferred action level. If the lab cannot constrain the $U_{MR}$ at the BTV, then an alternative lab action level will be established, at which the $U_{MR}$ criteria for each radionuclide can be met.
- The ability to accurately predict the $U_M$ at the cleanup level is a key principle in the development of LUT values and requires a reliable determination of the lab action level.

# EPA Recommendations (cont.)

- Use a single lab to develop LUT values to avoid multiple MDCs and for analyses of all samples collected from future phases of investigation, remediation, and closure of Area IV Study Area
  - Pros: consistency in MQOs
  - Cons: potential for single point failure (e.g., without a backup lab, **failure** of the single lab would potentially disable the LUT development project)
- If multiple labs used, such as use for analysis of split samples, then effort should be made to ensure MQOs are the same.

# EPA Recommendations (cont.)

- Determining LUT values:
  - Not so simple to go get a lab now (e.g., timing, funding, etc.). Will need it when we do cleanup.
- What can we use now to aid us in making remedial decisions?
  - LUT goals: RRCs are the minimum standard for consideration when developing LUT values.
  - RRCs are based on established BTVs and method MDCs that represent a reliable estimate for technologically and practically achievable MDCs for future rad assessment or remediation at SSFL.

# LUT Development Sequence

- Establish program-specific parameters:
  - Remediation schedule
  - Number and collection rate for samples
  - Radionuclides to be reported
  - Period of lab performance
  - Expected turnaround time for analysis and reporting
  - Establish achievable MQOs

# LUT Development Sequence (cont.)

- Then procure a lab, using a rigorous MQO process, to develop input from the lab that is necessary for calculating the LUT value. The input values are performance-based, and require method validation study, per MARLAP requirements.

- DTSC calculates LUT values, based on lab-specific cleanup levels and lab's method uncertainty for results at the cleanup level.

Questions?

# Upcoming Look-Up Table Events

Radiological Look-Up Table

- DTSC/Community Stakeholder meeting – February

Chemical Look-Up Table

- DTSC post final Chemical Background Report and response public comments - December
- DTSC/Community Stakeholder meeting - January

Radiological Look-Up Table approach and Chemical Look-Up Table values - March

# For Questions or Comments:

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